# Health Consultation

Perchlorate Contamination in the Victoria Farms Mutual Water Company System

LOCKHEED PROPULSION COMPANY
(a/k/a LOCKHEED MARTIN PROPULSION CORPORATION)

REDLANDS, SAN BERNARDINO COUNTY, CALIFORNIA

CERCLIS NO. CAD980893093

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U.S. DEPARTMENT OF HEALTH AND HUMAN SERVICES
Public Health Service
Agency for Toxic Substances and Disease Registry
Division of Health Assessment and Consultation
Atlanta, Georgia 30333

# Health Consultation: A Note of Explanation

An ATSDR health consultation is a verbal or written response from ATSDR to a specific request for information about health risks related to a specific site, a chemical release, or the presence of hazardous material. In order to prevent or mitigate exposures, a consultation may lead to specific actions, such as restricting use of or replacing water supplies; intensifying environmental sampling; restricting site access; or removing the contaminated material.

In addition, consultations may recommend additional public health actions, such as conducting health surveillance activities to evaluate exposure or trends in adverse health outcomes; conducting biological indicators of exposure studies to assess exposure; and providing health education for health care providers and community members. This concludes the health consultation process for this site, unless additional information is obtained by ATSDR which, in the Agency's opinion, indicates a need to revise or append the conclusions previously issued.

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Prepared by:

California Department of Health Services
Under Cooperative Agreement with the
Agency for Toxic Substances and Disease Registry

## BACKGROUND AND STATEMENT OF ISSUES

The Environmental Health Investigations Branch (EHIB) of the California Department of Health Services (CDHS), under cooperative agreement with the Agency for Toxic Substance and Disease Registry (ATSDR) is conducting health assessment activities on the Lockheed Martin Propulsion Corporation hazardous waste site in San Bernardino County, California. This health consultation is one in a series that will address the impact of perchlorate contamination on water supply wells which serve a number of water purveyors throughout San Bernardino and Riverside counties. During this process, data and information on the release of hazardous substances and their impact to the public will be evaluated. In this health consultation, we will focus on describing the perchlorate contamination that has reached the Victoria Farms Mutual Water Company and evaluate the health impact that may have occurred from exposure to the perchlorate.

Perchlorate, in the form of ammonium perchlorate is used in the manufacture of solid rocket fuel, munitions, and pyrotechnics (fireworks). Historically, perchlorate has not been considered a common contaminant in groundwater. In April 1997, the Division of Drinking Water and Environmental Management (DDW) of the CDHS, began sampling groundwater basins throughout California for perchlorate. The expanded sampling conducted by the DDW was in response to perchlorate being found at levels of health concern in groundwater at the Aerojet-General Corporation site in Sacramento County, a facility which manufactured liquid and solid rocket propellants.

Lockheed Propulsion Company (LPC) began operations in 1961, after acquiring the site from Grand Central Rocket Company (GCRC), which began operations in 1954. The site consisted of approximately 400 acres which were leased from the City of Redlands (Figure 1). The GCRC facility was used for the production, testing and disposal of solid rocket propellant used in rocket motors. LPC was used as a research and production facility of solid fuel rockets for military and commercial use until 1974. Over the years LPC disposed of hazardous waste by open burning, discharge into evaporation and settling ponds, and inadvertent dumping (1). Some of these discharges, including perchlorate, entered the groundwater and moved off-site of the LPC boundary (1).

In the 1980's trichloroethylene (TCE), a solvent, was detected in groundwater wells in the Redlands area. As a result of the TCE contamination, the California Regional Water Quality Control Board (CRWQCB) and the Department of Toxic Substance Control (DTSC) provided funding for the installation of a Liquid Phase Granular Activated Carbon (GAC) groundwater treatment system to treat/clean the water from the TCE impacted wells (2). Subsequent investigations by the CRWQCB determined that LPC was the source of the TCE contamination (2).

The Victoria Farms Mutual Water Company is one of several water districts that receive water from the Bunker Hill Groundwater Basin. The Victoria Farms system has been impacted by the perchlorate contamination which seems to originate from the LPC site.

The Victoria Farms system supplies water to 316 connections, approximately 1000 customers, for residential use (2). In addition to the residential customers there are 3 small businesses, with approximately 18 employees and a day care facility. Prior to the discovery of perchlorate, Victoria Farms had 3 groundwater wells (well #1 active/standby, well #3 active and well #2 inactive). The system was supplemented with the City of San Bernardino's water supply. Well #1 drew water from a depth of 184 feet. Well #3, the primary water supply well in the system drew water from a depth of 600 feet. Well #2 has been inactive since the 1980's due to substandard construction (3). The City of San Bernardino receives their water from aquifers within the Bunker Hill Basin which have not been impacted by the perchlorate plume. Victoria Farms well water was blended at a 1:1 ratio with San Bernardino's water in order to meet maximum contaminant levels (MCL) for nitrate, dibromochloropropane (DBCP) a soil fumigant used in the citrus groves, and naturally occurring uranium. Nitrate and DBCP are contaminants commonly found in agricultural areas and are not associated with the Lockheed site. TCE, a site associated contaminant, has not been detected in any of the Victoria Farms water supply wells at levels above the MCL (5 ppb) (3). No surface water sources were used to supplement the water supply (2).

**DISCUSSION**

In April 1997, the San Bernardino District field staff of the DDW began testing public water supply wells in areas where perchlorate contamination was suspected to exist (4). Because Lockheed used solid rocket fuel, the DDW field staff in the San Bernardino office sampled wells located to the west, downgradient of the Lockheed facility, including two wells of the Victoria Farms system. The well samples were processed by the CDHS Sanitation and Radiation Laboratory located in Los Angeles, with a quantification limit of 4ppb. The United States Environmental Protection Agency (USEPA) provisional action level for perchlorate in drinking water is 18 ppb, at which the water purveyor would have to notify their water customers (5).

In May, DDW received confirmation of perchlorate contamination in a number of drinking water supply wells throughout the Bunker Hill Basin. On May 28, 1997 DDW staff held a meeting with the water purveyors to inform them of the perchlorate contamination. DDW staff provided each water purveyor with the sampling results and health effects information relating to perchlorate exposure.

In the April 1997 sampling, perchlorate was detected in Victoria Farms system near well #3 at a level of 37 ppb (4). Since this level exceeded USEPA's provisional level of 18 ppb, Victoria Farms Water Co. took this well off line on June 7, 1997 and prepared a notice (see attachment) which informed their customers of the perchlorate contamination (6,7). Lockheed Martin Corporation (formerly LPC) supplied Victoria Farms customers with bottled water while a permanent connection, capable of supplying all of Victoria Farms water needs, was made with the City of San Bernardino's water supply. The notice informed their customers that perchlorate levels detected in well #3, prior to blending, were estimated to be between 40 to 50 ppb (7). Since June 7, 1997 customers served by Victoria Farms received water solely provided by the City of San Bernardino, which has not been impacted by the perchlorate contamination originating from the LPC.

## Community Concerns

The population in the Victoria Farms neighborhood is approximately 1,000 with about half the population of Hispanic origin. Although single family homes predominate, there are several apartment complexes and scattered duplexes. Of the adults who are employed, most are in blue collar jobs.

CDHS staff contacted Victoria Farms staff to discuss any potential health concerns expressed by their customers. CDHS staff was informed that at a meeting organized by a community member on June 17, 1997, Victoria Farms Water Company shared information about perchlorate contamination (6). Although Victoria Farms was not able to provide names of impacted customers, CDHS was able to locate several customers mentioned in a newspaper article published in The Sun in June, 1997.

CDHS staff interviewed three people in the Victoria Farms neighborhood. None of these residents seemed to have ongoing health concerns about the effects of drinking the water contaminated with perchlorate. All three respondents were upset that they had been given such little explanation about why they had been changed to bottled water. Even though the water source for the residents coming from the City of San Bernardino does not contain perchlorate, there seems to be ongoing concern about the quality of the pipes from the old system and whether the pipes still contain perchlorate. On the whole, the residents contacted felt like they needed to be kept better informed about the source of their water and the perchlorate contamination.

## Exposure Pathways

For target populations to be exposed to environmental contamination, there must be a mechanism by which the contamination comes into direct contact with the target population (8). An exposure pathway is the description of this mechanism. A completed exposure pathway consists of five parts: a source of contamination, an environmental medium and transport mechanism, a point of exposure, a route of exposure, and a receptor population. For a population to be exposed to an environmental contaminant, a completed exposure pathway (all five elements) must be present.

In the next few paragraphs, CDHS will describe how we evaluated the completed exposure pathway related to the perchlorate contamination in the Victoria Farms system for three receptor populations: adult resident, adult worker and the frequent customer/visitor (Table 1). All of these pathways are considered to have occurred in the past.

CDHS considers that no current exposure pathway exists within the Victoria Farms system because there is no quantifiable level of perchlorate being delivered to the user. It seems unlikely a future exposure pathway exists for the Victoria Farms user.

It is not clear when the perchlorate contamination reached the Victoria Farms wells, because monitoring did not begin until 1997. Although there is not good monitoring information, one can estimate when the perchlorate plume first impacted the Victoria Farms wells. The DDW staff estimated that perchlorate has been a contaminant in Victoria Farms wells since 1994 (3). The estimation was based on the velocity of the plume movement (approximately 2-5 feet per day), which was determined from previous hydrogeologic investigations (3).

When we evaluated the potential health impact from exposure to contaminated potable water, CDHS considered all routes of exposure to perchlorate in water. The most important route of exposure is through ingestion of the water. We did not evaluate exposure from eating homegrown fruits and vegetables that may have been irrigated with perchlorate-contaminated water, because we are not aware of bioconcentration parameters related to perchlorate (there are investigations into this issue, see Public Health Recommendations and Action Section). We did not evaluate inhalation exposure to perchlorate in water because perchlorate is not volatile (does not become a gas).

For certain chemicals, skin contact with contaminated water can be an important route of exposure. Generally speaking, skin absorption of a chemical is based on the lipophilic characteristics of a chemical (i.e. a chemical that prefers fat-like surroundings). Inorganic ions such as perchlorate do not like being in fat-like surroundings and thus their uptake through the skin, a fat-like environment, are typically less than 10% and frequently less than 1%. Since the permeability characteristic for perchlorate is not known, and ammonium perchlorate has relevant physical and chemical characteristics similar to cadmium chloride, CDHS used the permeability characteristics of cadmium chloride (0.0012 cm/hour) to evaluate skin exposure to perchlorate (9). We found that skin contact would result in an exposure dose estimate that is less that 0.5% of the dose estimate that would be received by ingesting the water. Therefore, CDHS focused on ingestion in calculating dose estimates.

CDHS has estimated the amount of Victoria Farms perchlorate-contaminated water that was ingested for the residential consumer, the adult worker, and the frequent customer/visitor. In this analysis of exposure through ingestion, it will be assumed that there is 100% absorption of perchlorate into the body from the gut from the amount of water that is ingested.

Toxicological Evaluation

This health consultation focuses on perchlorate exposure and thus the toxicological evaluation will focus on perchlorate. CDHS acknowledges that there are low levels (below drinking water standard) of nitrates, DBCP and naturally occurring uranium, in the well water; however, the affect of these compounds in combination with perchlorate will not be evaluated due to the lack of toxicological information about such combinations.

Most of the information about the toxicity of perchlorate came from studies of potassium perchlorate as a treatment for hyperthyroidism, resulting from Graves' Disease. Perchlorate inhibits the excessive synthesis and secretion of thyroid hormones (and can relieve the symptoms

of Grave's Disease) by competitively inhibiting the accumulation of iodide in the thyroid (10). Discontinued administration of ammonium perchlorate to Graves' Disease patients resulted in a return to their hyperthyroid condition (11). People who have been treated with perchlorate have reported gastrointestinal irritation, skin rash, and hematological effects including agranulocytosis and lymphadenopathy (10). The severe hematological effects seem to be more likely to occur when large doses of more than 1,000 mg/day (approximately 14mg/kg/day for a 154 pound man) are used (12).

Potassium perchlorate was extensively used for treatment of Graves' Disease patients in the late 1950s and 1960s. After the reports of the severe hematological effects, potassium perchlorate was not used for many years (13). In the early 1980s, physicians in Europe began using it again for the treatment of Graves Disease, and reporting no serious side effects occurring as long as the dose was kept below 1,000 mg/day (12). In addition, potassium perchlorate has been used in treating thyrotoxicosis resulting as a side effect from other drug therapies (14-18).

There are only a few studies of short-term exposure in persons without Graves' Disease (19). The animal studies that have been conducted have also involved short-term exposures and the doses were too high to see a level where there was no effect on the thyroid. Both human and animal studies have primarily examined the effects of perchlorate on the thyroid, interference with the production of thyroid hormones resulting in a below normal level of thyroid hormone in circulation (hyperthyroidism). The effects of perchlorate on systems other than the thyroid needs to be explored, especially effects on the blood system (described above) and developmental effects (described later).

In 1992 and 1995, USEPA staff reviewed the perchlorate toxicological studies and derived a provisional reference dose (RfD) (5,19). An RfD is a dose to which a person could be exposed over long-term without having any appreciable risk of a non-cancer health effect occurring. According to the USEPA, a perchlorate dose of 0.14 mg/kg/day or smaller would not be expected to be associated with any adverse effect on the thyroid (this is called the NOAEL or No Observable Adverse Effect Level) (19,20). The USEPA then applied an uncertainty factor of 300 or 1000 to the NOAEL to derive an RfD of 1 to 5 x 10-4 mg/kg/day(5).

The uncertainty factor of 300 or 1000 is derived from multiplying the following:(5)

An uncertainty factor of 10 to account for extrapolation from the acute exposure in the NOAEL study to chronic exposure of an RfD.

¥An uncertainty factor for database deficiencies (3 or 10) to account for data limitations including limited data on subchronic and chronic exposure to low doses of perchlorate, limited data on other organ systems, limited data on the effects on the hematopoietic system, and a lack of reproductive and multigenerational data;

¥An uncertainty factor of 10 to protect sensitive subpopulations which would include groups such as hypothyroid patients and individuals with low iodine diets or with genetically impaired iodine accumulation.

The only information about the possible carcinogenicity of perchlorate has to do with cancers of the follicular thyroid cells (5). Interference with the normal thyroid-pituitary feedback mechanism, such as that which perchlorate does, can lead to thyroid follicular cell neoplasia. Several animal studies found that thyroid tumors were induced in both rats and mice by long-term administration of high doses of perchlorate. However, humans are not supposed to be as sensitive as the rat to thyroid cancer (21,22). Since perchlorate's possible carcinogenic effects on the thyroid are based on the same mechanism that determines its noncarcinogenic effects, it may be appropriate to consider the RfD as a dose which does not pose a significant risk of thyroid cancer (19).

It is even harder to determine whether or not perchlorate exposure can cause any other type of cancer. If a link is discovered, it will probably be based on perchlorate acting not as a mutagen (causing genetic changes) but rather as a growth promoter, an effect associated with a threshold. In other words, below a certain threshold, perchlorate would not have cancer-causing effects. More toxicological information is needed to determine whether perchlorate can cause cancer and if it can, at what dose this effect may start occurring.

Children's Health

Children are not small adults, their bodies are not fully developed, and may not respond to perchlorate in the same manner as an adult. For instance, thyroid hormone is critical to normal brain development and physical development, and the critical period of dependency on thyroid hormone begins in the uterus and extends up until three years of age. After the age of 3, thyroid hormone continues to play a primary role in physical development until puberty. Thus, a low level or absence of thyroid hormone in utero or in childhood may lead to irreversible mental retardation and retarded physical growth.

Perchlorate can cross the placenta and thus could effect the developing fetus, though these effects have not been studied in humans. It is known, however, that drugs currently being used to treat Graves' Disease such as propylthiouracil do cross the placenta and can produce neonatal hypothyroidism (23-24) and fetal in utero goiter (enlargement of the thyroid) (25-27). In fact, because the developing fetus's thyroid is immature, propylthiouracil is a more potent suppressor of thyroid function in the fetus than in the mother (28).

In a study of the effects of potassium perchlorate (740 mg/kg/day for the mother) fed to pregnant guinea pigs during pregnancy, a 15-fold enlargement of thyroid of the newborns was noted, even though no increase in the size of the mother's thyroids occurred (29). Thyroid hormone levels of the newborn guinea pigs were not measured in this study. Another animal study in which the mother was given fairly high levels of perchlorate, also resulted in increased thyroid weight in the offspring of the mother (30). At this time, it is unclear whether lower doses of perchlorate would effect the thyroid of the developing fetus and young child and thus affect thyroid function at a time when normal thyroid hormone production is important to brain development.

Though it is possible to estimate a dose for a child living within the Victoria Farms system, CDHS did not calculate this dose because we are not confident how to interpret the dose estimate. To

compare the estimate of a child's dose with toxicological information based on adult exposure ignores the fact that the child is not a small adult. Thus, until there is more information about perchlorate's effect on children, CDHS is not able to evaluate past exposures that occurred to child residents who received Victoria Farms water.

Animal studies are underway which are exploring the toxicity of perchlorate, including effects on the immune system and developmental effects (see Recommendations section at the end of the text for more information).

*Applying Provisional Reference Dose to Site Specific Action Levels:*

Using the USEPA's provisional reference dose (0.0001 to 0.0005 mg/kg/day) based on perchlorate's effect on the thyroid (5), CDHS evaluated the noncancer (thyroid) health impact of the completed exposure pathway, from exposure to perchlorate-contaminated water in the Victoria Farms system, for a period of 3 years. (The last concentration of perchlorate measured (37 ppb) in the well before it was taken off-line was used in the dose calculation).. We evaluated this completed exposure pathway for three receptor populations: adult resident, adult worker and the occasional visitor (Table 1). There is no current or future exposure to perchlorate-contaminated water in the Victoria Farms system.

**Residential exposure in the Victoria Farms System:** CDHS estimated the exposure for a resident who lives 24 hours per day, 7 days a week, for 52 weeks of the year, for 3 years, who was served by the Victoria Farms Mutual Water Company. Concentrations in well #3 were used for the dose calculation of the residential exposure because this was the primary well used to serve customers. CDHS assumed that the residents drank 2 liters/day. CDHS estimated doses for a resident exposed to water coming from Victoria Farms system well #3, with a contaminant level of 37 ppb (Table 2 is a list of the exposure parameters used in the toxicological evaluation).

The estimated dose for the resident exposed to perchlorate-contaminated water from Victoria Farms system well #3 (0.0011 mg/kg/day), exceed the provisional reference dose range (0.0001 to 0.0005 mg/kg/day) which means that noncancer (thyroid depression) health effects may have occurred when residents were exposed to perchlorate-contaminated water from the Victoria Farms system. However, because there is a very large uncertainty factor associated with the provisional reference dose and the estimated doses do not approach the NOAEL (0.14 mg/kg/day), it is unlikely that residential exposure to Victoria Farms water caused any noncancer health effects.

Victoria Farms Mutual Water Company took well #3 out of service in June 1997, so there is no current or future exposure to perchlorate contaminated water. Since it is thought that the effect of perchlorate on the thyroid function returns to normal after exposure to perchlorate ceases, any effects that may have occurred to residents receiving water from well #3, should no longer be occurring.

**Worker exposure in the Victoria Farms System:** CDHS estimated the exposure for a worker who works eight hours a day, five days a week, for 50 weeks of the year (assumes a two week vacation) at a business that is served by the Victoria Farms system well #3. Concentrations in well #3 were used for the dose calculation of the worker exposure because this was the primary well used to serve business connections. CDHS will assume that the worker is involved in manual labor and thus drinks a relatively large quantity of water during the day (3.7 liters) (31). CDHS estimated doses for the worker exposed for an 8 hour period, to water coming from Victoria Farms system well #3, with a contaminant level of 37 ppb; the estimation averages the consumption amount over a 24 hour period and does not assume the worker drinks the entire 3.7 liters while at work (Table 2 is a list of the exposure parameters used in the toxicological evaluation).

The estimated dose for a worker exposed to water from the Victoria Farms system well #3 (0.0004 mg/kg/day) does not exceed the provisional reference dose range (0.0001 to 0.0005 mg/kg/day). This means that noncancer (thyroid depression) health effects would not have occurred to the worker drinking water from well #3.

**Frequent customer or visitor exposure to the Victoria Farms System:** CDHS estimated the exposure for an adult visitor or customer who goes once a day, five days a week, for 50 weeks of the year (assumes a two week vacation) to a business that is served by the Victoria Farms Mutual Water Company. Concentrations in well #3 were used for the dose calculation of the occasional visitor because this was the primary well used to serve residential and business connections. CDHS assumed that an adult customer/visitor drinks one cup of water (0.24 liters) per visit to the business. CDHS estimated doses for an adult customer/visitor exposed to water coming from well #3, with a contaminant level of 37ppb (Table 2 is a list of the exposure parameters used in the toxicological evaluation).

The estimated dose for the frequent adult customer/visitor exposed to water from well #3 (0.00009) mg/kg/day) does not exceed the provisional reference dose range (0.0001 to 0.0005 mg/kg/day). This means that noncancer (thyroid depression) health effects would not have occurred to the frequent adult customer/visitor drinking water from well #3 of the Victoria Farms system.

## CONCLUSIONS

Based upon the information reviewed, CDHS identified three completed exposure pathways to perchlorate-contaminated water in the Victoria Farms system. Residents who were served by the Victoria Farms Water Mutual Company may have been exposed to perchlorate on a regular basis when they drank the water. Other exposures occurred over a short duration resulting in very low doses to workers and the frequent visitor or customer to business establishments located in the Victoria Farms System.

It is hard to say when the perchlorate first contaminated Victoria Farms wells, it may have been as early as 1994. As a result of being notified of the perchlorate contamination the Victoria Farms Water Company stopped distributing perchlorate-contaminated water on June 7, 1997.

There is currently a three hundred to thousand-fold uncertainty factor incorporated into the USEPA provisional action level (18ppb). Since the uncertainty factors are supposed to take account for the somewhat limited toxicological data, it is conceivable that as more toxicological data becomes available, a change in the (provisional) reference dose may occur.

The estimated dose for an adult resident exposed to water from the Victoria Farms well #3 exceeded the provisional reference dose range which means that noncancer (thyroid depression) health effects may have occurred when the resident was exposed to water from this well. However, because there is a very large uncertainty factor associated with the provisional reference dose and the estimated dose does not approach the NOAEL, it is unlikely that this exposure caused any noncancer health effects. This well is no longer being used, thus any noncancer health effects that may have occurred should no longer be occurring now that the exposure has ceased.

The estimated doses for an adult worker and frequent customer/visitor exposed to water from well #3 do not exceed the provisional reference dose range. This means that noncancer (thyroid depression) health effects would not have occurred to the worker or frequent customer/visitor drinking the water from well #3.

Based on the information available at the time this health consultation was written, CDHS concludes that Victoria Farms well water may have posed a health hazard from approximately 1994 to 1997. Since this well water is no longer being used, there is no current health hazard from perchlorate to Victoria Farms customers.

## PUBLIC HEALTH RECOMMENDATIONS AND ACTIONS

The Public Health Recommendations and Actions Plan (PHRAP) for this site contains a description of actions taken, to be taken, or under consideration by ATSDR and CDHS or others at and near the site. The purpose of the PHRAP is to ensure that this health consultation not only identifies public health hazards, but also provides a plan of action designed to mitigate and prevent adverse human health effects resulting from exposure to hazardous substances in the environment. The CDHS and ATSDR will follow-up on this plan to ensure that the actions are carried out.

### Actions Completed:

1. An alternative water source, free of perchlorate contamination, is being utilized to supply water to Victoria Farms customers.

2. In June 1997, Victoria Farms Mutual Water Company sent a notice to their customers informing them of the past perchlorate contamination in the systems wells.

3. CDHS prepared information about perchlorate and health for another perchlorate-contaminated site in California. This information was made available to DDW staff.

**Actions Planned:**

1. The Air Force and the Perchlorate Work Group (a number of manufacturers and users of perchlorate) are sponsoring an investigation into fate and transport questions regarding perchlorate. For instance, they will investigate if perchlorate is taken up and bioconcentrated in vegetable crops and determine the skin permeability of perchlorate.

2. The Air Force and the Perchlorate Work Group are sponsoring a series of animal studies to address some of the information lacking in understanding perchlorate toxicology. CDHS cooperative agreement staff, along with other state and federal scientists, were asked by the Air Force to recommend and oversee the planning of the animal studies. As of August 1997, the study protocols have been finalized and the process of choosing a laboratory to conduct the studies is underway.

**Recommendations for Further Action:**

1. Victoria Farms Mutual Water Company continue to communicate with their customers about the perchlorate issue.

2. If indicated based on new toxicological information, CDHS will review toxicological evaluation of past perchlorate exposures in the Victoria Farms system.

3. CDHS will evaluate how to keep residents better informed and whether a perchlorate fact sheet is needed.

4. CDHS will consider the feasibility of conducting a dose reconstruction exposure investigation of perchlorate exposure in the Victoria Farms System.

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## CERTIFICATION

The Perchlorate Contamination in the Victoria Farms Mutual Water Company System Health Consultation was prepared by the California Department of Health Services under a cooperative agreement with the Agency for Toxic Substances and Disease Registry (ATSDR). It is in accordance with approved methodology and procedures existing at the time the health consultation was initiated.

William Gruen

Technical Project Officer, SPS, SSAB, DHAC

The Division of Health Assessment and Consultation, ATSDR, has reviewed this health consultation and concurs with its findings.

Richard Gillig

Chief, SPS, SSAB, DHAC, ATSDR

# FIGURE

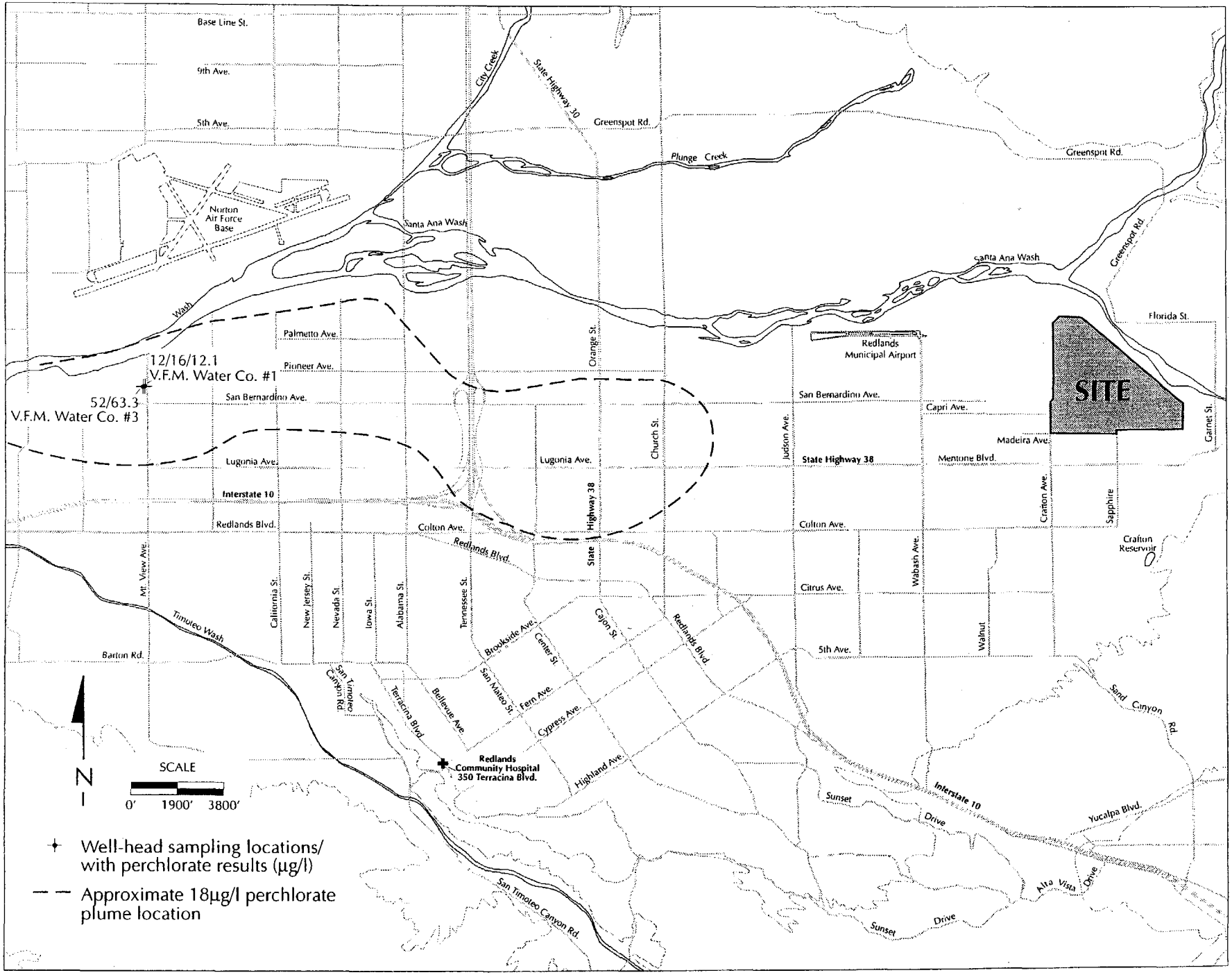


**Figure 1.** Lockheed Martin Corporation Vicinity Map and Victoria Farms Mutual Water Co. — Well-head Locations

# TABLES

**Table 1. Perchlorate Contamination in the Victoria Farms System - Completed Exposure Pathway for Receptor Population**

| Receptor Group Pathway Name | Source | Environmental Medium | Point of Exposure | Route of Exposure | Exposed Population | Time |
|---|---|---|---|---|---|---|
| Residential Exposure in the Victoria Farms System | Lockheed Martin Propulsion Corporation | Groundwater wells in the Victoria Farms System | Residential Tap | Ingestion | Adult Residents | Past |
| Worker Exposure in the Victoria Farms System | Lockheed Martin Propulsion Corporation | Groundwater wells in the Victoria Farms System | Business Tap | Ingestion | Adult Workers | Past |
| Frequent Customer/Visitor Exposure in the Victoria Farms System | Lockheed Martin Propulsion Corporation | Groundwater wells in the Victoria Farms System | Residential Tap or Business Tap | Ingestion | Adult Frequent Customer or Visitor | Past |

## Table 2. Exposure Factors for Completed Exposure Pathway in the Victoria Farms System

| Pathway Name | Exposure Parameter | Value |
|---|---|---|
| Resident Exposure in the Victoria Farms System | Ingestion Rate | 2 liters/day |
| | Body Weight | 70 kilograms |
| | Exposure Frequency | 7 days/week<br>52 weeks/year |
| | Gut Absorption of Perchlorate | 100% |
| | Averaging Factor | 365 days/year |
| Worker Exposure in the Victoria Farms System | Ingestion Rate | 3.7 liters/day |
| | Body Weight | 70 kilograms |
| | Exposure Frequency | 8 hours/day<br>5 days/week<br>50 weeks/year |
| | Gut Absorption of Perchlorate | 100% |
| | Averaging Factor | 365 days/year |

| | | |
|---|---|---|
| Frequent Customer / Visitor Exposure in the Victoria Farms System | Ingestion Rate | 0.24 liters (1 cup)/visit |
| | Body Weight | 70 kilograms |
| | Exposure Frequency | 5 visits/week<br>50 weeks/year |
| | Gut Absorption of Perchlorate | 100% |
| | Averaging Factor | 365 days/year |

# ATTACHMENT

# Victoria Farms Mutual Water Co.

P.O. Box 10744
San Bernardino, California 92423-0744
(909) 796-2962

## IMPORTANT NOTICE

This is to notify you that the Victoria Farms Company Well #3 has been sampled by the Department of Health Services for a chemical called perchlorate. In order to determine a safe level for a given chemical in drinking water, scientists rely on information from health studies. When there is limited information available, ( as is the case here), scientists include a large margin of safety until there is sufficient information to develop a permanent standard. There are no federal or state standards for perchlorates in the drinking water.

The Department of Health Services has set a Provisional Action Level for perchlorate at 18 parts per billion (ppb). This level includes a 300 fold margin of safety. In other words, this level is 300 times less than the level at which NO adverse health effects were observed in a study.

In terms of your drinking water, Victoria Farms Company Well #3 has been sampled to contain between 52 and 63 parts per billion. This water is being blended so that the concentration in the drinking water is estimated to be between 40 and 50 ppb. It is possible, at these concentrations, there may be a slight effect on the thyroid which will return to normal after water is consumed that is perchlorate free.

At very high levels, perchlorate could interfere with the function of the thyroid. In order to be conservative and protective of your health, it is recommended that you do not drink or cook with your water. Please note, there are NO known health risks associated with bathing or washing in this water. Irrigation with this water is also not a concern.

We anticipate that a new pipeline to an alternative source of water that has no perchlorates will be completed within two weeks. A temporary connection may be completed by Monday, June 9, 1997. Until one of these alternatives is constructed, bottled water is being provided to you by Lockheed Martin Corporation which consists of 25 gallons of water and one dispenser. After the additional connections are completed, Well #3 will be turned off. Therefore, water provided to you will be perchlorate free. In the meantime, if you need additional water, please call Hinckley Schmitt at (800) 537-2217. Thank you for your patience and understanding in the next few weeks.

If you have any questions, please call Sean Bradley of Victoria Farms at (909) 796-2962 or Eric Fraser of the Department of Health Services at (909) 383-4328.